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U. S. DEPARTMENT OF AGRICULTURE

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Station Paper NO. 106

December 1959

U.S. DEPARTMENT OF AGRICULTURE
U.S. FOREST SERVICE
Southeastern Forest Experiment Station
Asheville, North Carolina

Silvical Characteristics of Southern Red Oak

(Quercus falcata Michx.)

by

G. P. Haney and L. J. Metz

Southern red oak (Quercus falcata Michx.) is one of the commonest of upland southern oaks (fig. 1). Its range extends from southern New Jersey (latitude 40°15' N.) southward to central Florida (latitude 28°30' N.), through the Gulf states to the valley of the Brazos River in Texas (longitude 97°30' W.), and through Arkansas and southeastern Missouri to central Tennessee and Kentucky, and southern Illinois and Indiana (latitude 39°00' N.) (fig. 2). Some southern red oak is also found in southern Ohio and western West Virginia (14, 17). It is comparatively rare in the North Atlantic states, where it is found only in the neighborhood of the coast. However, in the South Atlantic states it is one of the prevalent inhabitants of the forests which cover the Piedmont between the Coastal Plain and the Appalachian Mountains (16). It is less frequently found in the coastal pine belt, and is very rare in the bottomlands of the Mississippi Delta (7).

HABITAT CONDITIONS

CLIMATIC

The climate in which southern red oak grows is a humid, temperate one, characterized by hot summers, mild and short winters, and no distinct dry season (20). The average annual precipitation is between 40 and 50 inches, of which half occurs during the growing season (April through September). Throughout the major portion of the southern red oak range, the average annual temperature is between 60° and 70° F., with daily extremes of near zero to near or above 100°. At the northern edge of its range the average annual temperature is between 50° and 60°, with individual extremes of -10° to 100°.

EDAPHIC

Southern red oak is characteristically an upland species occurring on dry, infertile, sandy or clay soils[1/] (6, 7, 8, 11, 21). It is also found widely on sandy loam, sandy clay loam, and silty clay loam soils. Occasionally this species occurs in fertile streambottoms, and here attains its largest size.

1/ Applequist, Martin B. Stand composition of upland hardwood forests as related to soil type in the Duke Forest. 1941. (Unpublished thesis, Duke University, School of Forestry.)

Figure 1.--A southern red oak 74 years old and 21 inches d.b.h. The excellent form, pruning, and horizontal gray stripes (caused by lichens) are characteristic for this species on better sites. West Springs, S. C.

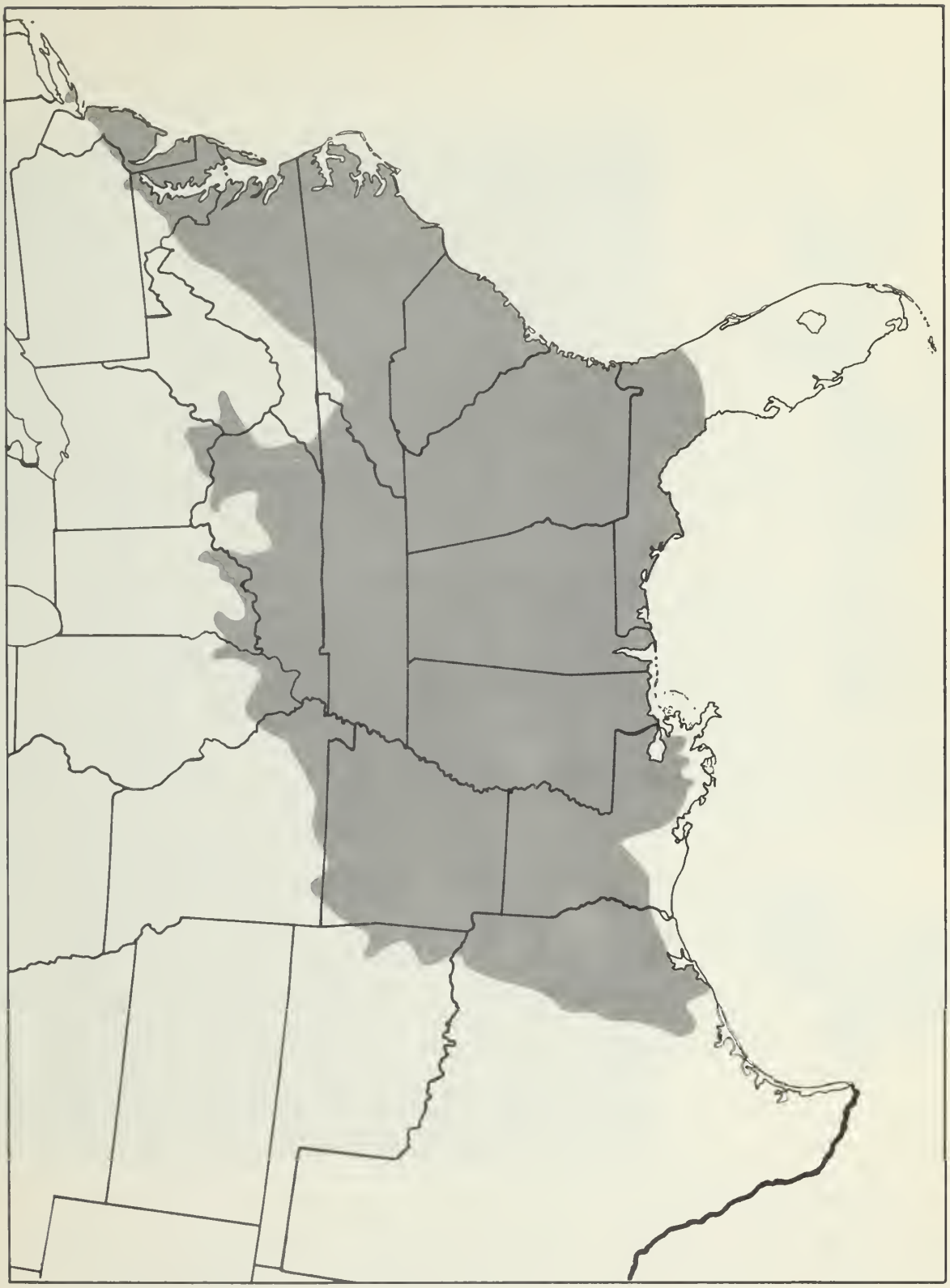

Figure 2.--Botanical range of southern red oak.

PHYSIOGRAPHIC

Throughout its range, southern red oak is most frequently found at elevations between 500 and 2,000 feet above sea level (12). It also occurs at lower elevations in the Coastal Plain. It is characteristically an upland species and usually occurs on the dry ridgetops and upper portions of slopes facing south and west, rather than on the more moist lower slopes and bottomlands, or north and east aspects (11).

BIOTIC

Southern red oak is represented in 13 cover types as defined by the Society of American Foresters (19). It is a major component of the Virginia pine-southern red oak type and the shortleaf pine-oak type, and is a minor element of the following cover types: shortleaf pine-Virginia pine; Virginia pine; loblolly pine-shortleaf pine; loblolly pine; loblolly pine-hardwood; beech-southern magnolia; and scarlet oak. Occasionally it occurs in the longleaf pine type, the swamp chestnut oak-cherrybark oak type, and the post oak-black oak type.

Throughout most of its range, southern red oak is commonly associated with white oak (Quercus alba), black oak (Quercus velutina), scarlet oak (Quercus coccinea), post oak (Quercus stellata), blackjack oak (Quercus marilandica), sweetgum (Liquidambar styraciflua), blackgum (Nyssa sylvatica), and hickory (Carya spp.). Along the foothills of the Appalachians, Virginia pine (Pinus virginiana), pitch pine (Pinus rigida), and chestnut oak (Quercus prinus) are also common associates. Other common associates are shortleaf pine (Pinus echinata) in the Piedmont region, loblolly pine (Pinus taeda) in the Coastal Plain region, and both shortleaf and loblolly pine in eastern Texas, southern Arkansas, and Louisiana.

Some occasional associates of southern red oak in various parts of its range are swamp chestnut oak (Quercus michauxii), cherrybark oak (Quercus falcata var. pagodaefolia), white ash (Fraxinus americana), slash pine (Pinus elliottii), longleaf pine (Pinus palustris), yellow-poplar (Liriodendron tulipifera), southern magnolia (Magnolia grandiflora), American beech (Fagus grandifolia), red maple (Acer rubrum), flowering dogwood (Cornus florida), and persimmon (Diospyros virginiana).

LIFE HISTORY

SEEDING HABITS

Flowering of southern red oak occurs during April and May throughout most of its range. The fruit ripens in September and October, the second season after flowering, and seedfall occurs during these months (21) (fig. 3). As in many of the oaks, the acorn is subject to damage by acorn weevils, such as Curculio baculi, Curculio longidens, Curculio pardalis, and Conotrachelus posticatus, and the filbertworm, Melissopus latiferreanus (2).

Figure 3.--Typical bark, leaf, twig and bud, and fruit of southern red oak.

Seed production usually begins when a tree is about 25 years of age, but maximum production usually occurs between the ages of 50 and 75 years.

Dissemination of acorns by gravity is important on steep slopes. The hoarding habit of squirrels is important in the dispersal of seed of many of the nut trees, and the oaks are no exception (21).

VEGETATIVE PROPAGATION

Southern red oak sprouts vigorously from the stump when the shoot has been killed or cut back (3, 22). Sprouting is more prevalent on young stems 10 inches or less in diameter. This species, like most of the oaks, is difficult to propagate by cuttings (18).

SEEDLING DEVELOPMENT

The seed of southern red oak germinate under natural conditions in the spring following seedfall (21). The specific requirements for the germination and survival of southern red oak seedlings have not been studied, so little can be said concerning seedling establishment. Southern red oak seedlings are damaged and often killed by the hickory spiral borer, Agrilus arcuatus var. torquatus, and the oak borer, Aneflomorpha subpubescens (2).

SAPLING STAGE TO MATURITY

At maturity, southern red oak is a medium-sized tree, usually from 70 to 80 feet in height and 2 to 3 feet in diameter. When growing under forest conditions it develops a long, straight trunk and upward reaching limbs that form a high, rounded crown (4). Maximum age attained is about 150 years.

No data on growth rates and yields have ever been compiled for southern red oak.

Baker (1) rates southern red oak as intermediate in tolerance when compared to its associates. However, Jemison and Hepting (12) rate it as intolerant.

Southern red oak is susceptible to injury by fire because of its thin bark, and as a result of fire scars and other injuries, this species is often subject to heart rots (5). Cankers and rot caused by Polyporus hispidus are common on southern red oak. Other common rot fungi affecting this species include Hydnum erinaceus, Polyporus sulphureus, P. obtusus, Fomes Everhartii, F. Calkinsii, and Daedalea quercina (9).

Southern red oak is also susceptible to oak wilt, caused by Ceratocystis fagacearum. Trees attacked by this fungus may die within a month or two after the first symptoms become visible.

Oak leaf blister, caused by Taphrina caerulescens (10), and anthracnose, caused by Gnomonia veneta, are common during some seasons.

Grano[2/] has noted that epicormic branching is very profuse on southern red oak, especially in crop trees recently released. This reduces the quality of the timber and suggests that good quality will depend on dense stands.

Southern red oak is readily susceptible to borers and bark scarrers when trees are wounded or growing on poor sites (15). Wood-boring insects attacking this species are Agrilus bilineatus, Corthylus columbianus, and Cossula magnifica. The defoliators, Anisota senatoria and Anisota stigma, also do considerable damage (2).

RACES AND HYBRIDS

The races of southern red oak have not been established.

Little (13) recognizes two varieties and eight hybrids of southern red oak. The varieties are the typical southern red oak (Quercus falcata var. falcata), which has been the main subject of this paper, and cherrybark oak (Quercus falcata var. pagodaefolia). Cherrybark oak is important commercially in the Coastal Plain. The hybrids are as follows:

Quercus Xanceps Palmer (Quercus falcata X imbricaria)

Quercus Xbeaumontiana Sarg. (Quercus falcata X laurifolia)

Quercus Xblufftonensis Trel. (Quercus falcata X laevis)

Quercus Xgarlandensis Palmer (Quercus falcata X nigra)

Quercus Xjoorii Trel. (Quercus falcata X shumardii)

Quercus Xludoviciana Sarg. (Quercus falcata X phellos)

Quercus Xsubintegra Trel. (Quercus falcata X incana)

Quercus Xwilldenowiana (Dippel) Zabel (Quercus falcata X velutina)

2/ Grano, C. X. Determination of yields and returns from the management of upland oak. U. S. Forest Serv. South. Forest Expt. Sta. 1955. (Unpublished office report.)

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